A Logical Architecture for Future Avionics

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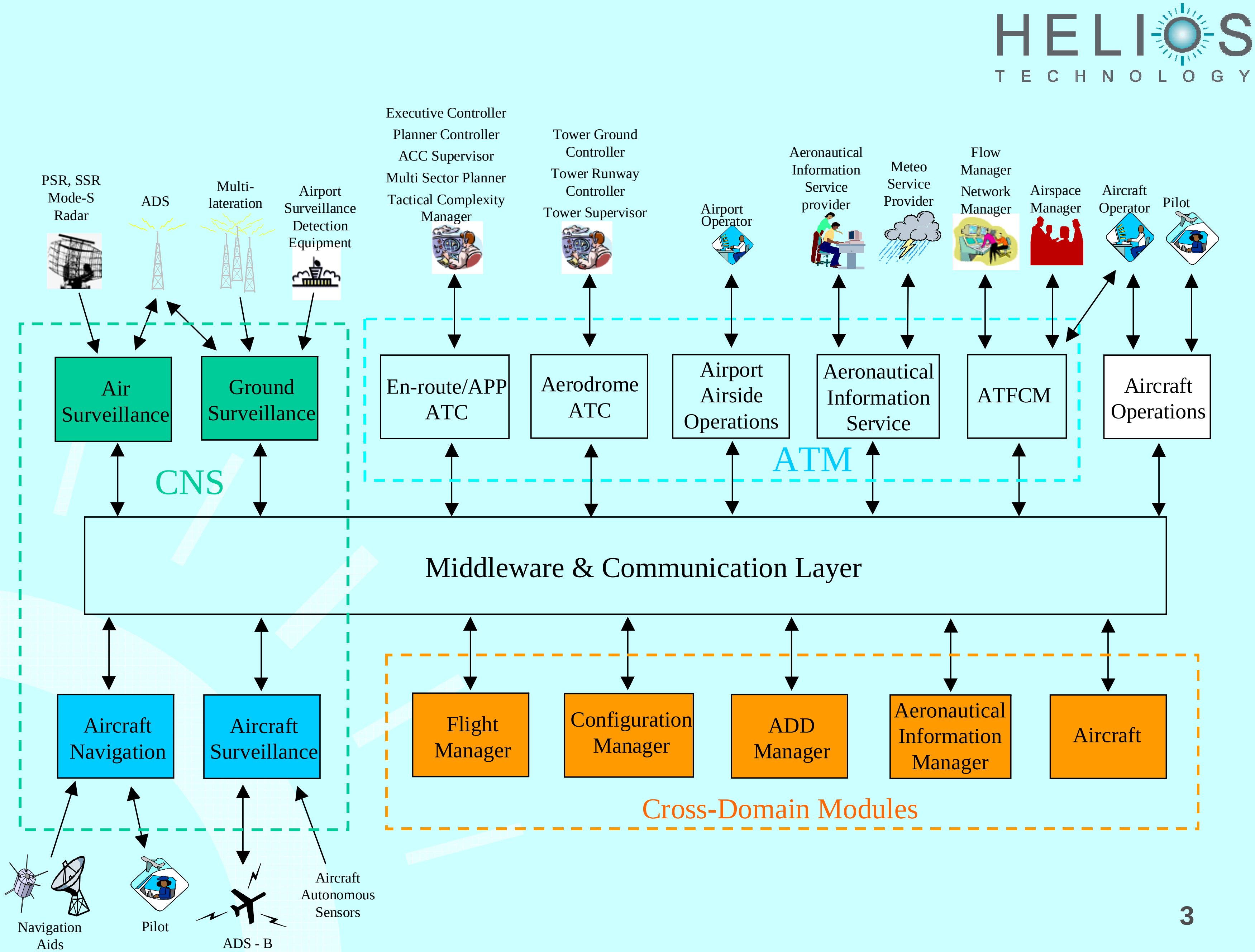
Agenda

- Purpose and structure of OATA
- Operational Concepts
- Avionics architecture
- Datalink Applications
- Conclusions
- Workshop Invitation


HELIOS TECHNOLOGY
PSR, SSR Mode-S Radar
ADS
Multi-lateration
Airport Surveillance Detection Equipment
Executive Controller
Planner Controller
ACC Supervisor
Multi Sector Planner
Tactical Complexity Manager
Tower Ground Controller
Tower Runway Controller
Tower Supervisor
Airport Operator
Aeronautical Information Service provider
Meteo Service Provider
Flow Manager
Network Manager
Airspace Manager
Aircraft Operator
Pilot
Air Surveillance
Ground Surveillance
CNS
En-route/APP ATC
Aerodrome ATC
Airport Airside Operations
Aeronautical Information Service
ATFCM
ATM
Aircraft Operations
Middleware & Communication Layer
Aircraft Navigation
Aircraft Surveillance
Flight Manager
Configuration Manager
ADD Manager
Aeronautical Information Manager
Aircraft
Cross-Domain Modules
Navigation Aids
Pilot
ADS - B
Aircraft Autonomous Sensors

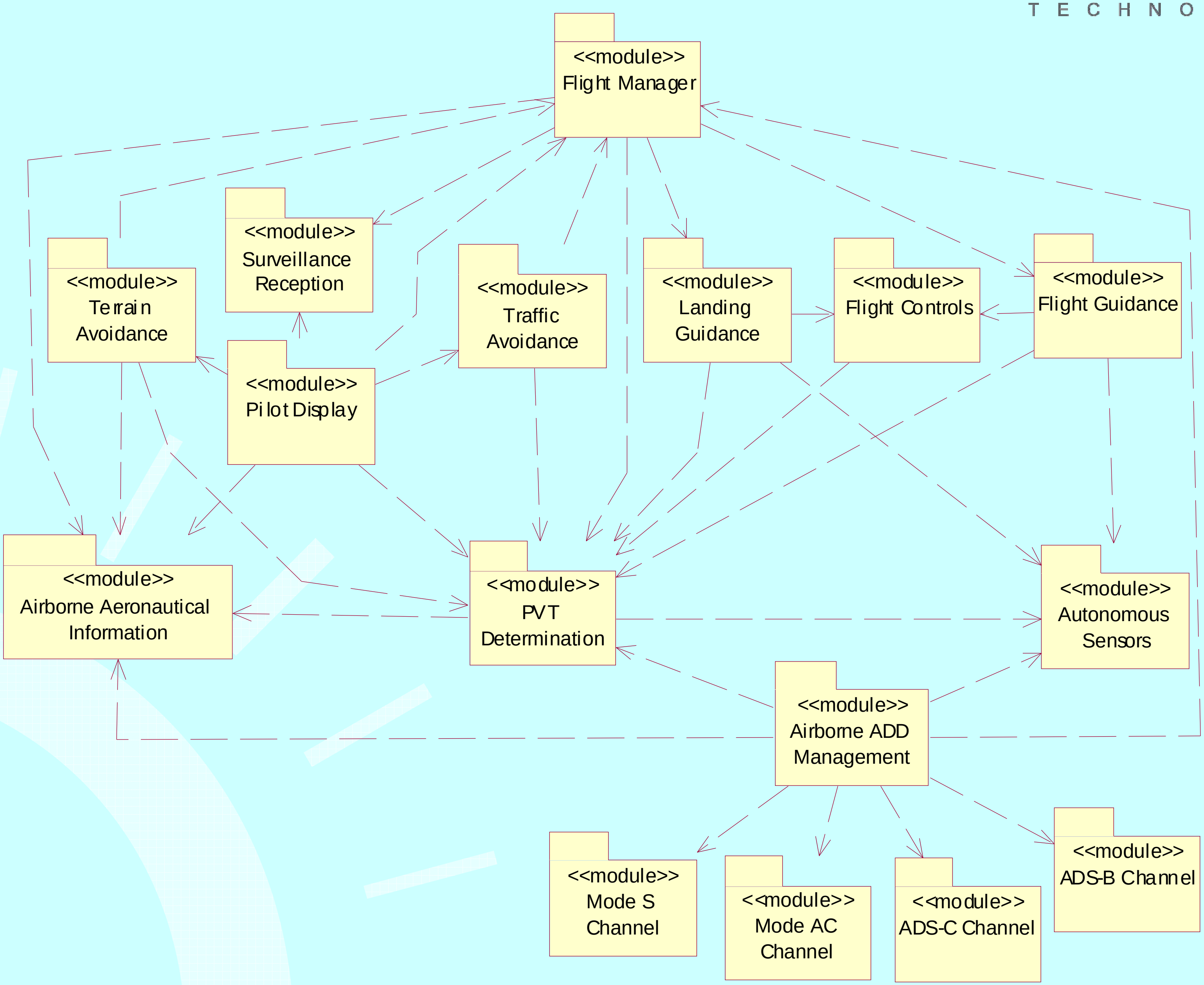
OATA Avionics

- Study Report:
  - Evolution of operational concepts for 2007, 2011 and 2020
  - Evolution of support avionics
  - Driven by Eurocontrol OCD and Industrial Reality
- Logical Architecture:
  - Based on 2011 Operational Concept
  - Developed in UML
  - 16 modules, 150 classes, 50 diagrams

Operational Concepts

- 2007 – A near-term scenario:
  - Today's control paradigm
  - Existing avionics
  - Initial datalink and air-ground ADS-B applications
- 2011 – A mid-term scenario:
  - More progressive form of flight planning
  - Greater integration of airborne data with the ground systems
  - Use of advanced RNP-RNAV
  - Increased collaborative decision making
- 2020 – A long-term scenario:
  - Trajectory negotiation enables advanced flight planning
  - Common air-ground understanding of entire trajectory
  - ground based planning to minimise conflicts and enable UPT

The Avionics Cluster



HELIOS TECHNOLOGY

Flight Control

Landing Guidance

Flight Guidance

Pilot Display

Autonomous Sensors

Flight Manager

PVT Determination

Airborne AIS

Terrain Avoidance

Traffic Avoidance

Surveillance Reception

Airborne ADD Manager

ADS-C Channel

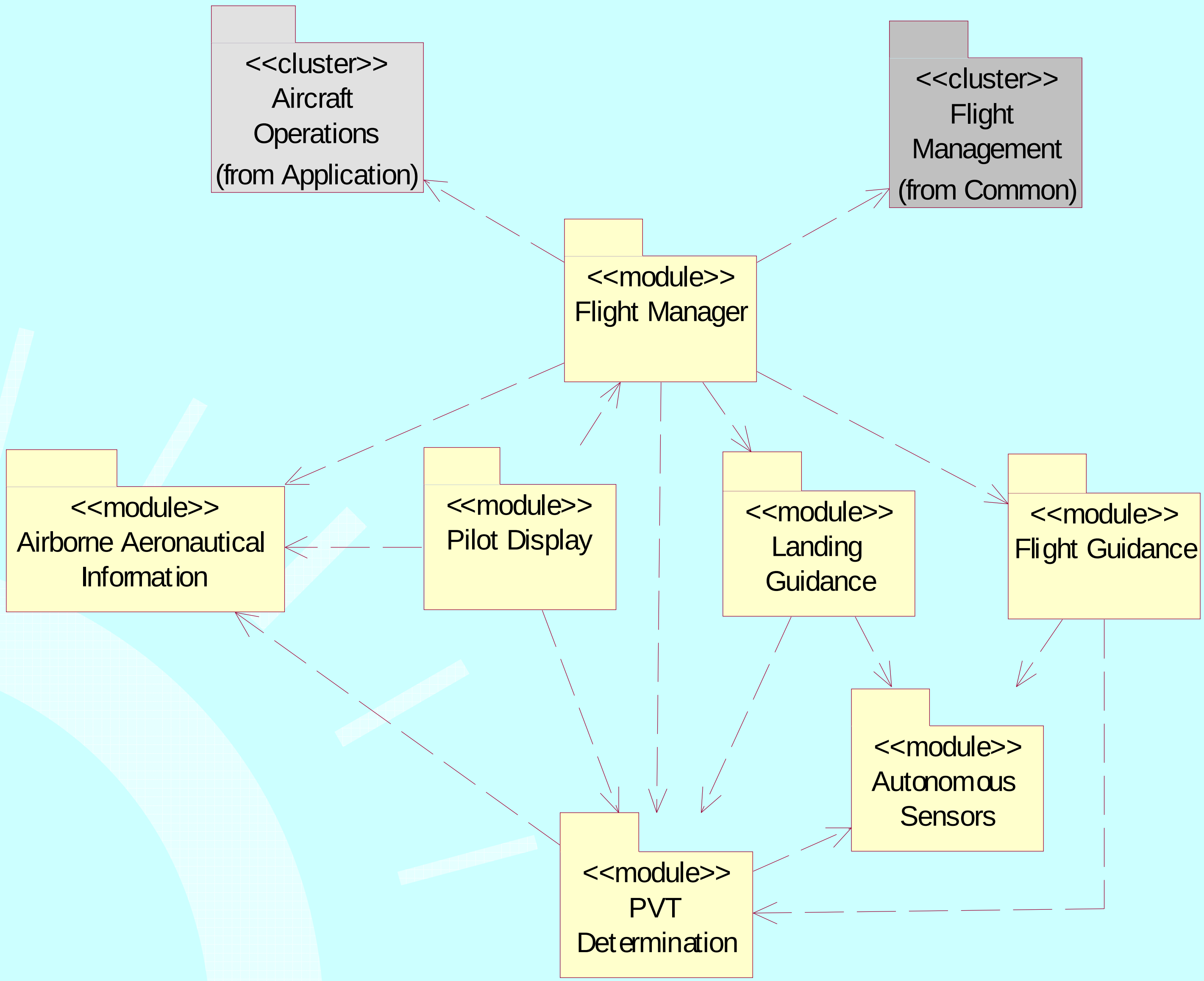
ADS-B Channel

Mode S Channel

Mode AC Channel

Flight Management

Flight management



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Situation Awareness

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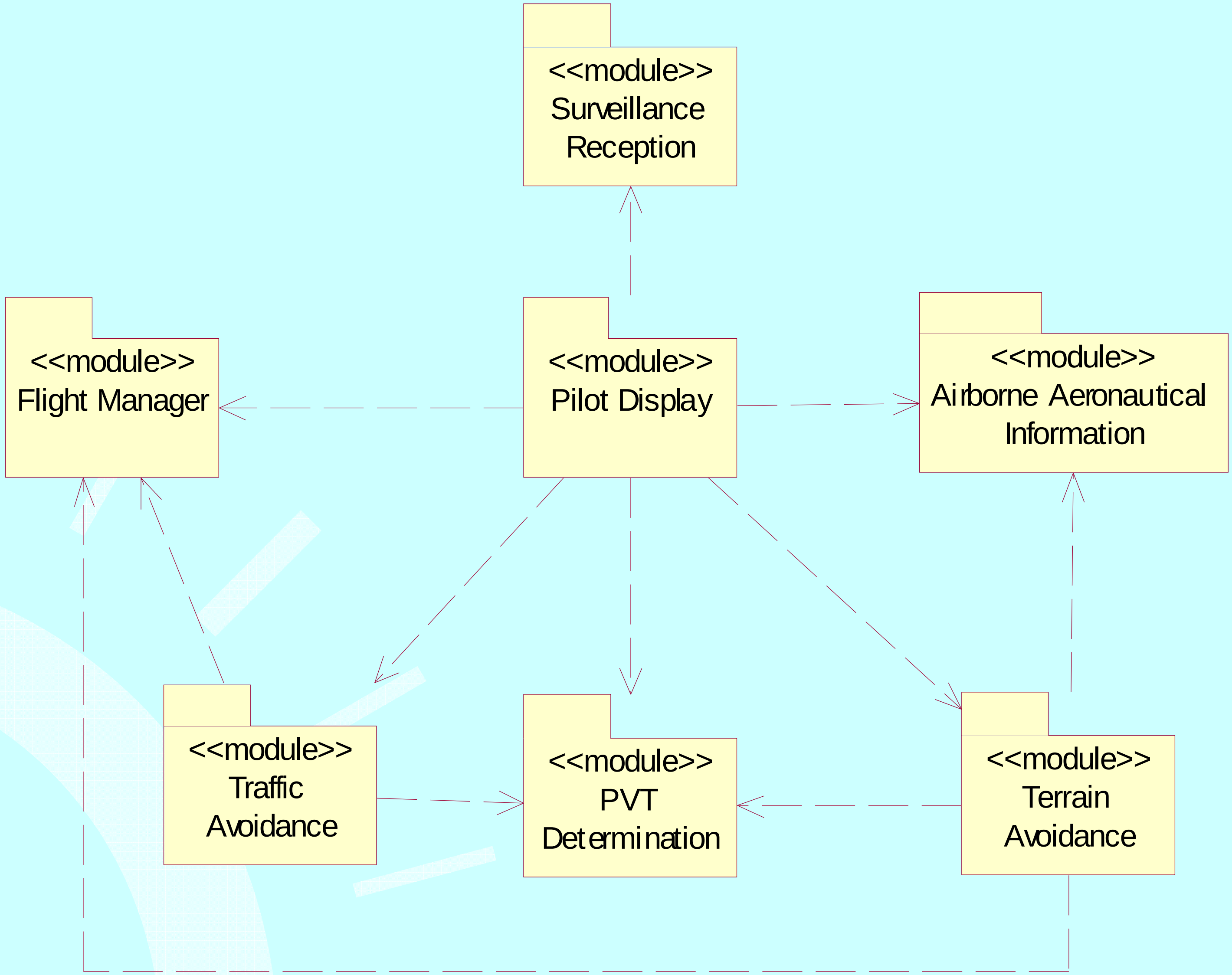

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Provision Of ADD

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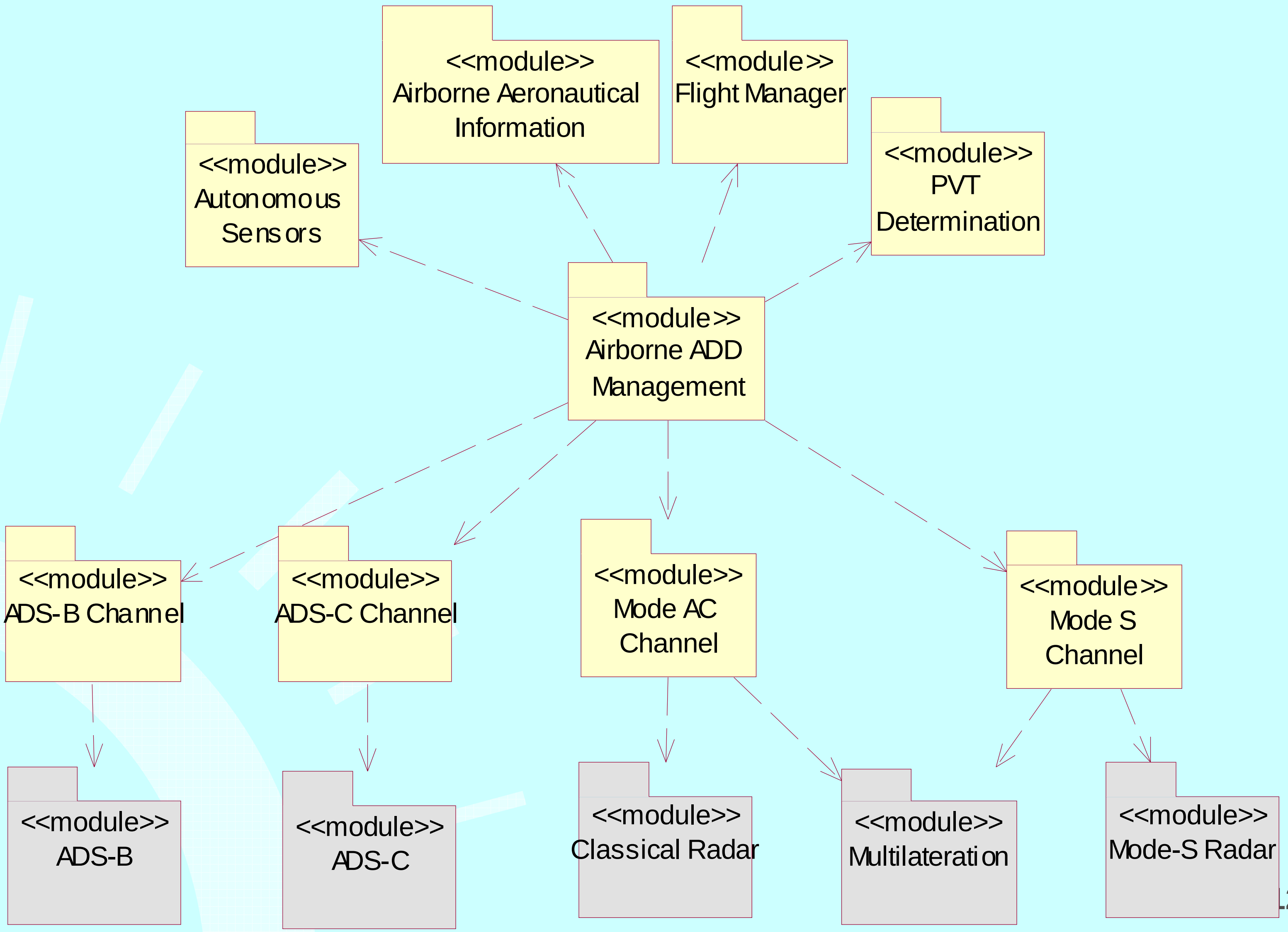

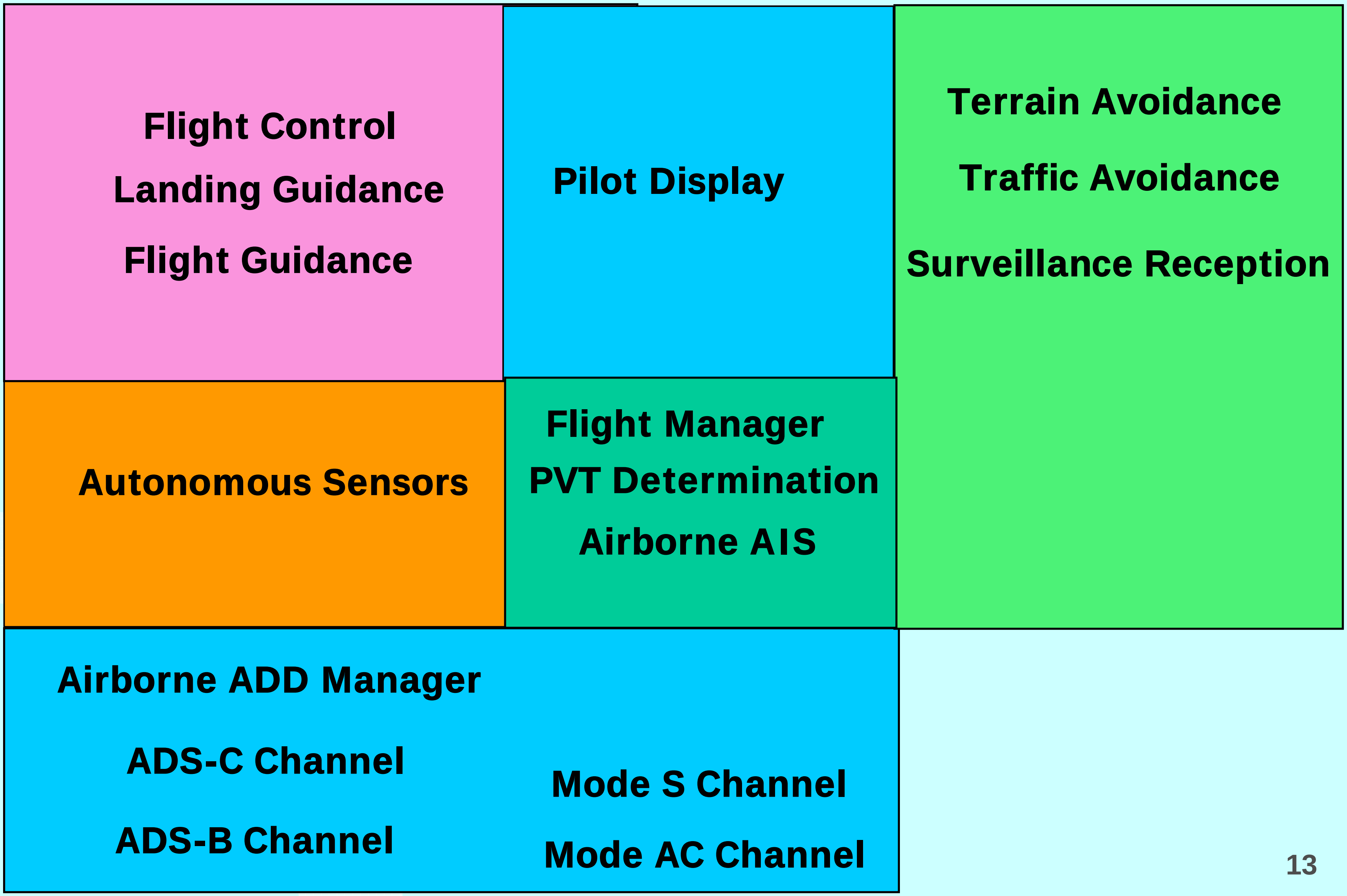
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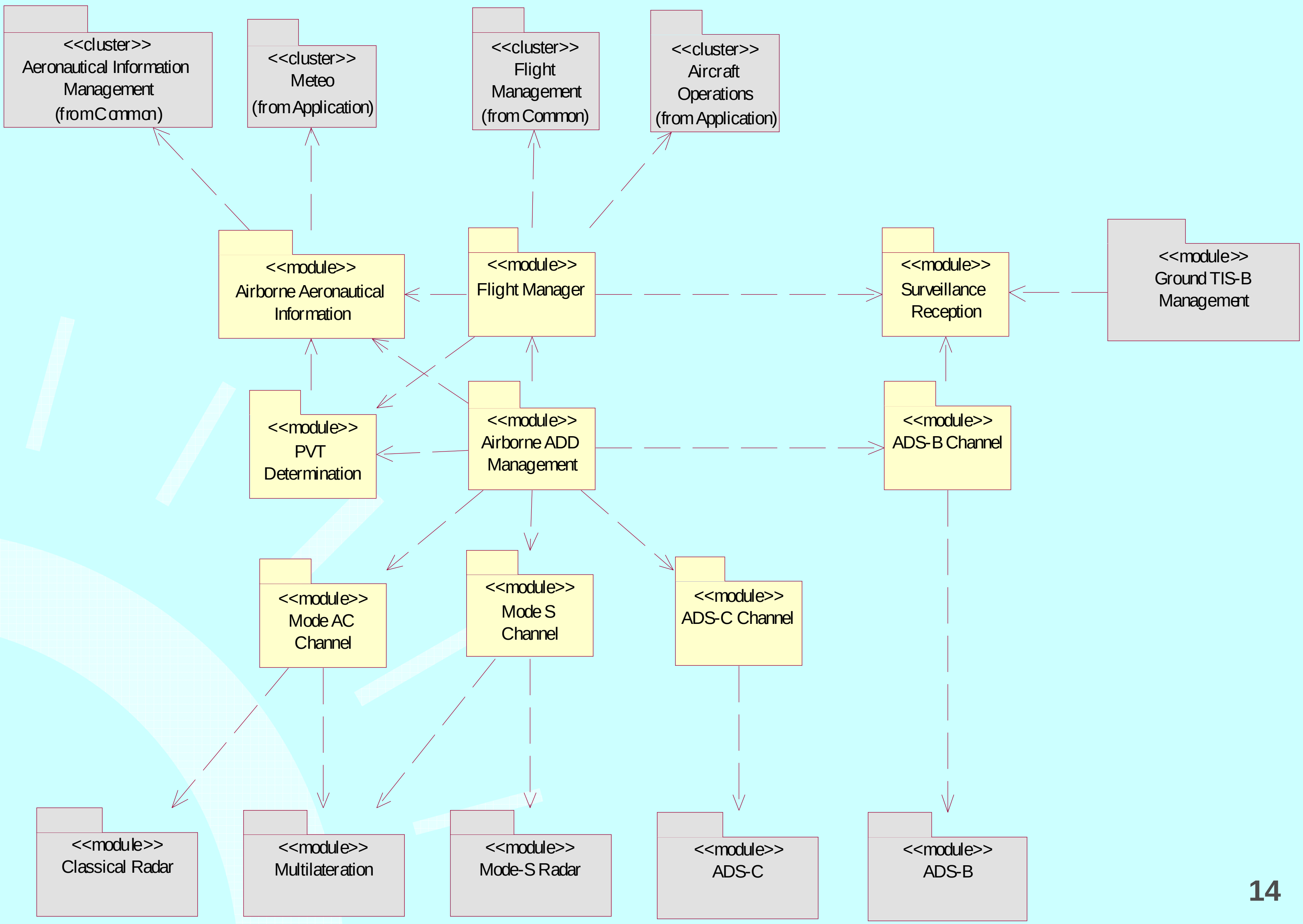
External Interactions



Datalink Applications

- Control:
  - ACL, ACM, DCL, DSC, D-TAXI and PPD
- Flight Plan:
  - FLIPCY, FLIPINT
- Surveillance:
  - Mode S ELS/EHS, Mode AC, ADS-B, ADS-C, CAP, SAP
- Flight Information:
  - DYNAV, D-ATIS, D-RVR and D-SIGMET

Trajectory Prediction

- Trajectory Prediction (TP) is a key enabler with controller automation
- Ground-based TP accuracy is limited by current representation of flight path:
  - Flight Plan + Tactical Clearances leave room for optimisation
  - The avionics applies airline preferences particularly in terms of cruise speed and vertical rates
- The aircraft has a better knowledge of intent

Support for Trajectory Prediction

- Datalink Applications:
  - CPDLC enables common understanding of tactical clearances
  - Flight Plan Consistency enabled by FLIPCY and FLIPINT
- Surveillance Applications:
  - Accurate position and velocity information
  - Short term (“selected”) intent
  - Long-term intent (as Trajectory Change Points)
- Still ambiguity in actual intent and extrapolation between TCPs:
  - Current initiative within NUP2 to extent TCP definition
- Alternate Solution:
  - Develop a language to accurately describe the flight regime
  - Boeing RTE refers to this as Flight Intent

Building a new paradigm

- Once developed Flight Intent could:
  - Provide a formal language to exchange trajectory information
  - ATC Systems, with sufficient knowledge of aircraft performance, could probe safe conflict free trajectories for uplink
  - Avionics could refine trajectory and downlink preferred solution
  - Solution would be a contract between ATC and Aircraft

- Issues:
  - Accurate knowledge of trajectory reduces the need for surveillance information.

Conclusions

- OATA:
  - A significant contribution to the definition of future ATM
  - Provides an underpinning to operational concept development
  - Identifies interfaces and interoperability requirements
- OATA Avionics:
  - Demonstrates the the increasing integration of avionics with ground systems
  - Enables rationalisation of air-ground interactions
  - Suggests accurate trajectory knowledge is an important enabler of trajectory negotiation for 2020 concepts

OATA Avionics Workshop

6th/7th October 2005
Centre de Congrès P. Baudis
Toulouse, France

Thank You

Comments to:

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